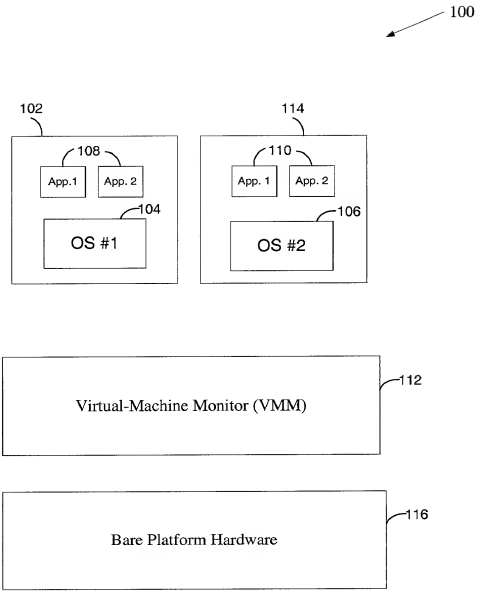
09752133-122700

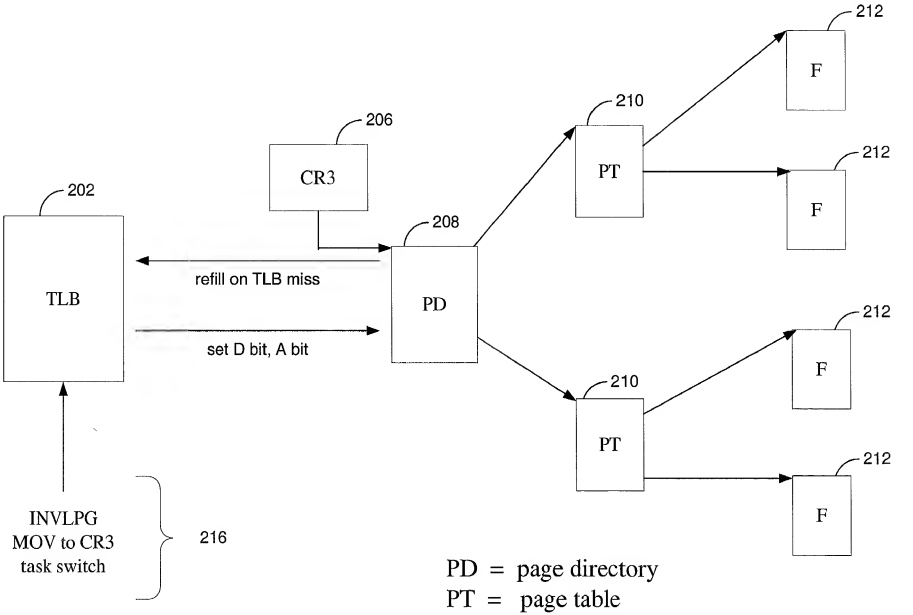


Prior Art

FIG. 1

09752133 .122700

Page-table hierarchy 204



Prior Art

FIG. 2

09752133.122700

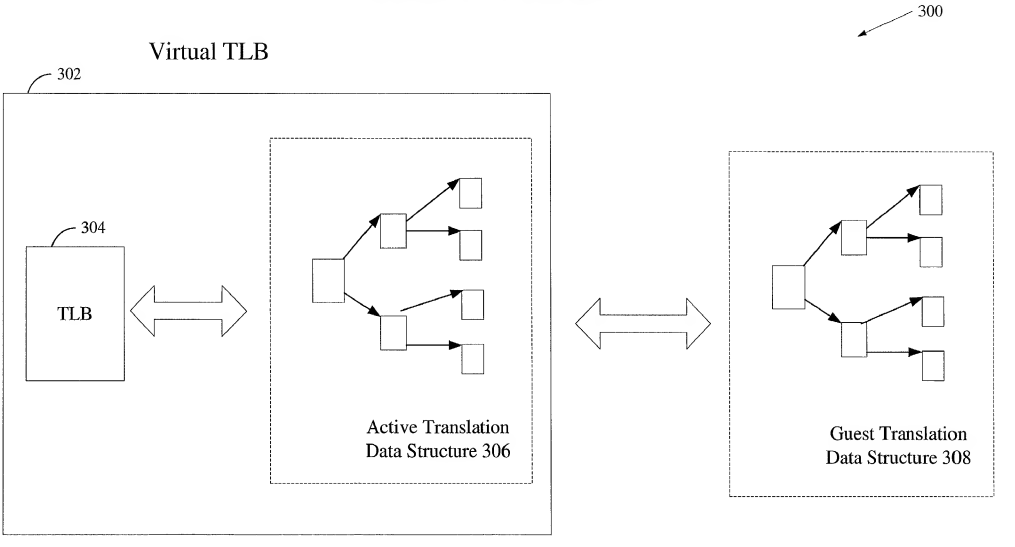


FIG. 3

09521333.122005

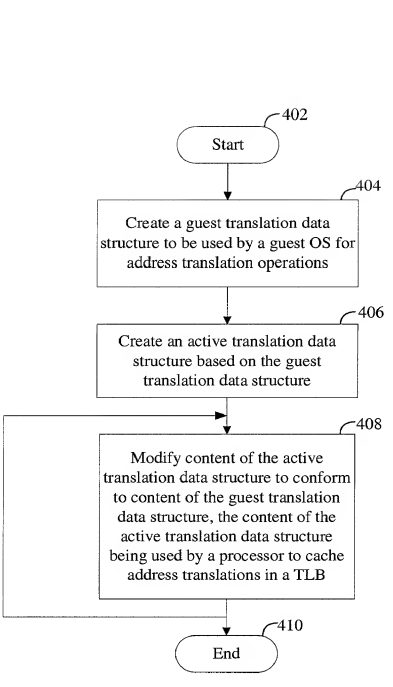


FIG. 4

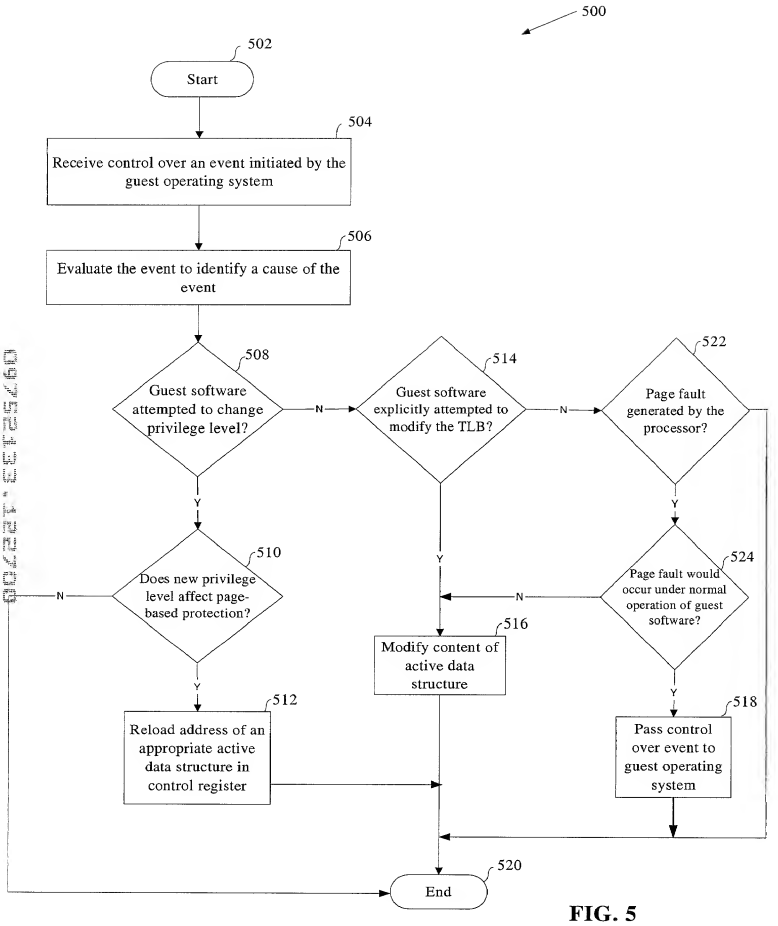

500
502
Start
504
Receive control over an event initiated by the guest operating system
506
Evaluate the event to identify a cause of the event
508
Guest software attempted to change privilege level?
N
Y
514
Guest software explicitly attempted to modify the TLB?
N
Y
522
Page fault generated by the processor?
Y
510
Does new privilege level affect page-based protection?
N
Y
524
Page fault would occur under normal operation of guest software?
N
Y
516
Modify content of active data structure
512
Reload address of an appropriate active data structure in control register
518
Pass control over event to guest operating system
520
End

FIG. 5

09752153.122700

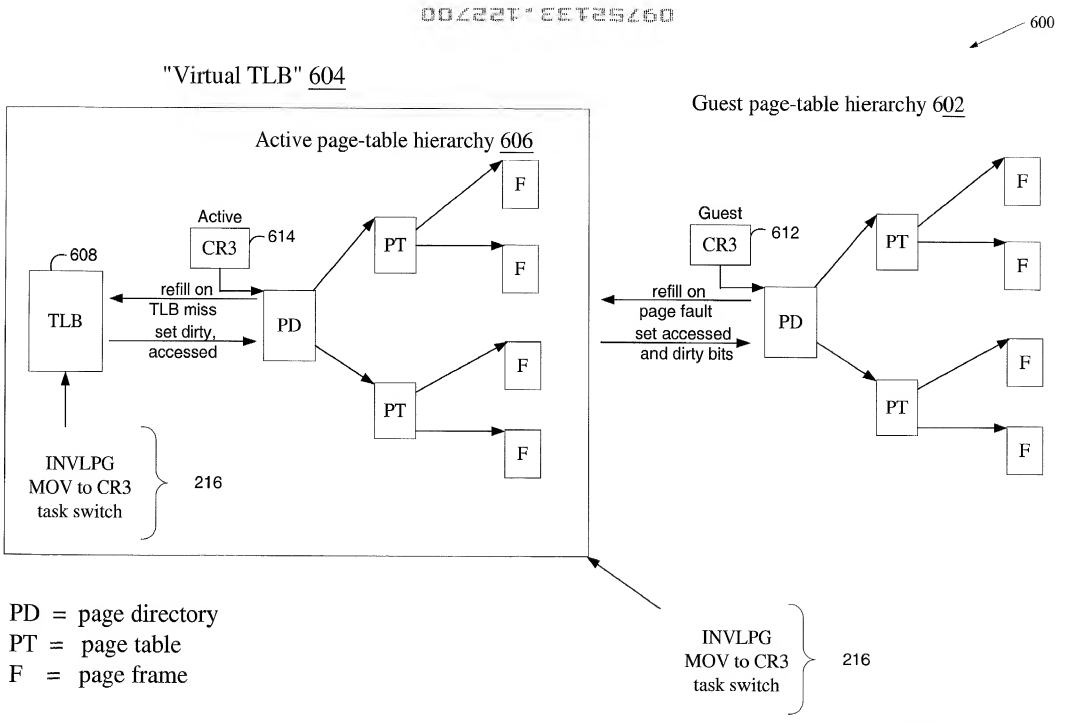


FIG. 6

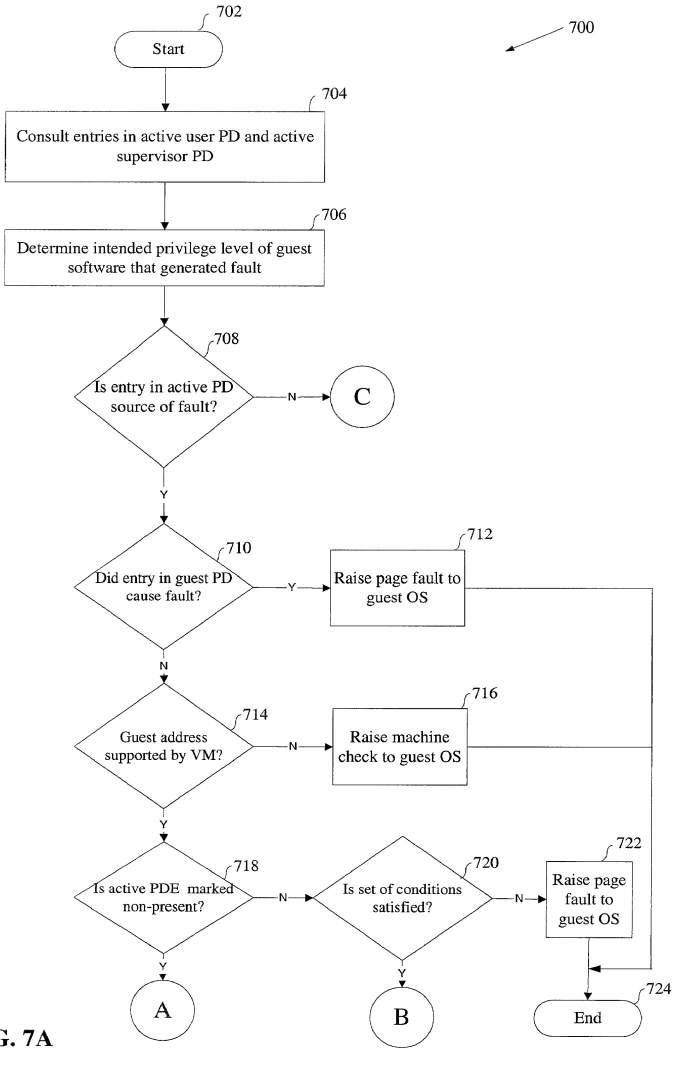

700
702
Start
704
Consult entries in active user PD and active supervisor PD
706
Determine intended privilege level of guest software that generated fault
708
Is entry in active PD source of fault?
N
C
Y
710
Did entry in guest PD cause fault?
Y
712
Raise page fault to guest OS
N
714
Guest address supported by VM?
N
716
Raise machine check to guest OS
Y
718
Is active PDE marked non-present?
N
720
Is set of conditions satisfied?
N
722
Raise page fault to guest OS
Y
Y
A
B
724
End

FIG. 7A

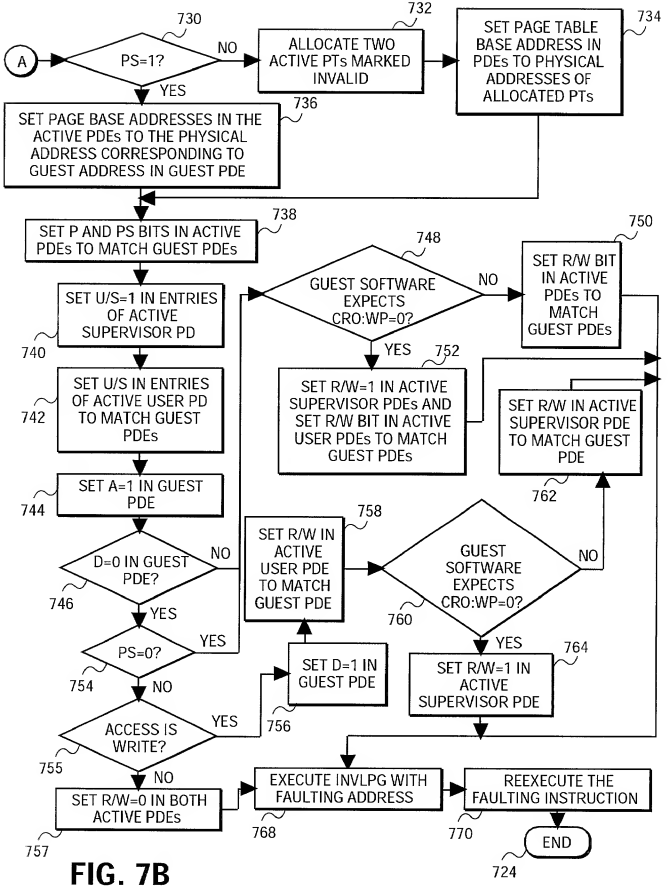

A
730
PS=1?
NO
YES
732
ALLOCATE TWO ACTIVE PTs MARKED INVALID
734
SET PAGE TABLE BASE ADDRESS IN PDEs TO PHYSICAL ADDRESSES OF ALLOCATED PTs
736
SET PAGE BASE ADDRESSES IN THE ACTIVE PDEs TO THE PHYSICAL ADDRESS CORRESPONDING TO GUEST ADDRESS IN GUEST PDE
738
SET P AND PS BITS IN ACTIVE PDEs TO MATCH GUEST PDEs
740
SET U/S=1 IN ENTRIES OF ACTIVE SUPERVISOR PD
742
SET U/S IN ENTRIES OF ACTIVE USER PD TO MATCH GUEST PDEs
744
SET A=1 IN GUEST PDE
746
D=0 IN GUEST PDE?
NO
YES
754
PS=0?
YES
NO
755
ACCESS IS WRITE?
YES
NO
757
SET R/W=0 IN BOTH ACTIVE PDEs
748
GUEST SOFTWARE EXPECTS CRO:WP=0?
NO
YES
750
SET R/W BIT IN ACTIVE PDEs TO MATCH GUEST PDEs
752
SET R/W=1 IN ACTIVE SUPERVISOR PDEs AND SET R/W BIT IN ACTIVE USER PDEs TO MATCH GUEST PDEs
762
SET R/W IN ACTIVE SUPERVISOR PDE TO MATCH GUEST PDE
758
SET R/W IN ACTIVE USER PDE TO MATCH GUEST PDE
760
GUEST SOFTWARE EXPECTS CRO:WP=0?
NO
YES
764
SET R/W=1 IN ACTIVE SUPERVISOR PDE
756
SET D=1 IN GUEST PDE
768
EXECUTE INVLPG WITH FAULTING ADDRESS
770
REEXECUTE THE FAULTING INSTRUCTION
724
END

FIG. 7B

DOCKET-EC25260

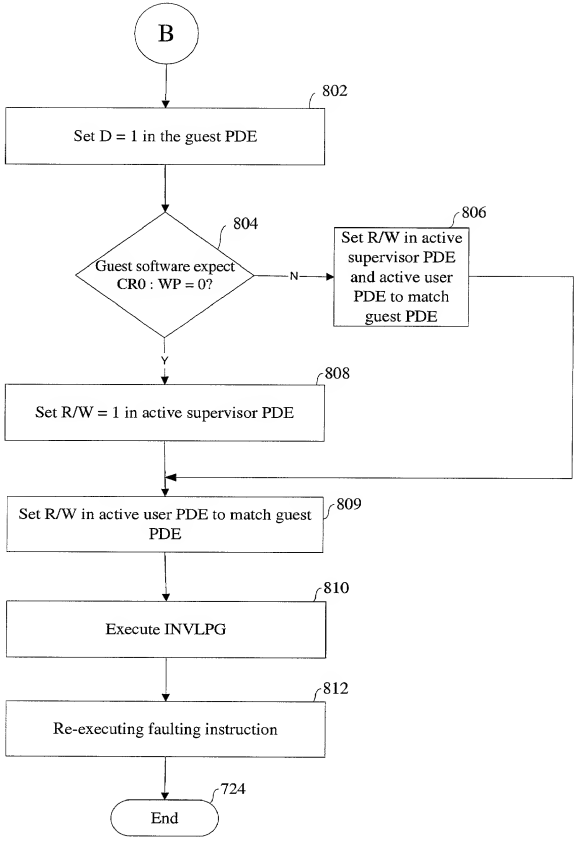


FIG. 7C

0074213-0074213-00

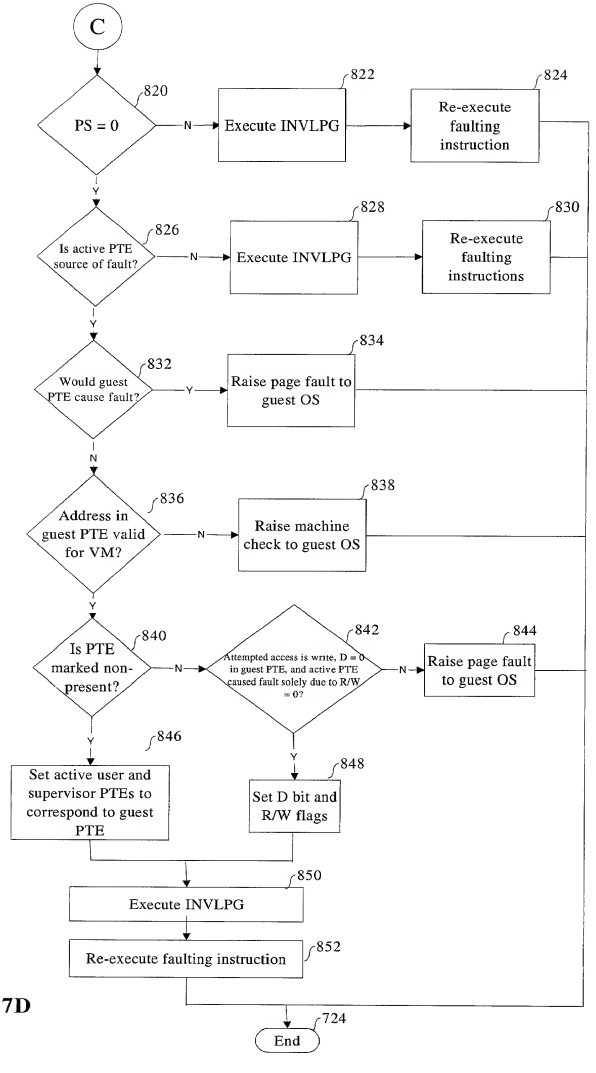


FIG. 7D

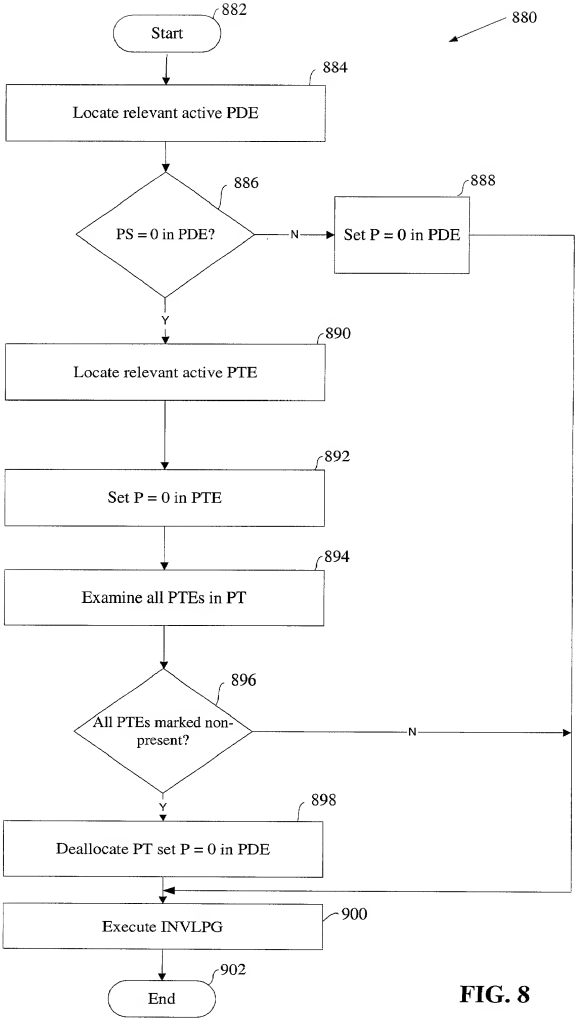

880
882
Start
884
Locate relevant active PDE
886
PS = 0 in PDE?
N
888
Set P = 0 in PDE
Y
890
Locate relevant active PTE
892
Set P = 0 in PTE
894
Examine all PTEs in PT
896
All PTEs marked non-present?
N
Y
898
Deallocate PT set P = 0 in PDE
900
Execute INVLPG
902
End

FIG. 8

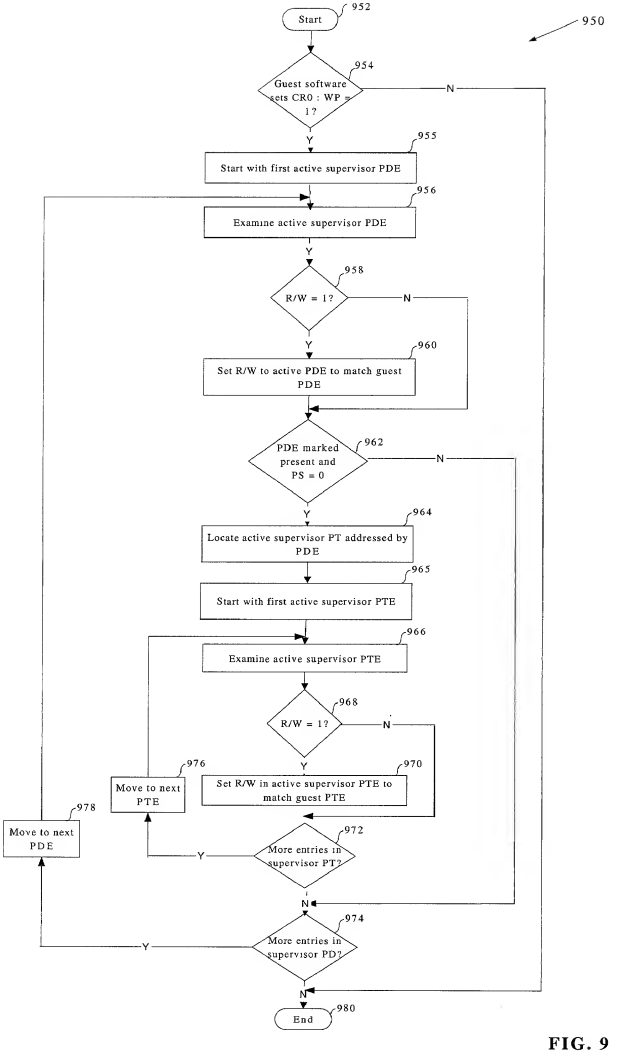

950
Start
952
Guest software sets CR0 : WP = 1?
954
N
Y
Start with first active supervisor PDE
955
Examine active supervisor PDE
956
Y
R/W = 1?
958
N
Y
Set R/W to active PDE to match guest PDE
960
PDE marked present and PS = 0
962
N
Y
Locate active supervisor PT addressed by PDE
964
Start with first active supervisor PTE
965
Examine active supervisor PTE
966
R/W = 1?
968
N
Y
Set R/W in active supervisor PTE to match guest PTE
970
Move to next PTE
976
Move to next PDE
978
More entries in supervisor PT?
972
Y
N
More entries in supervisor PD?
974
Y
N
End
980

FIG. 9

0042121-1213-0760

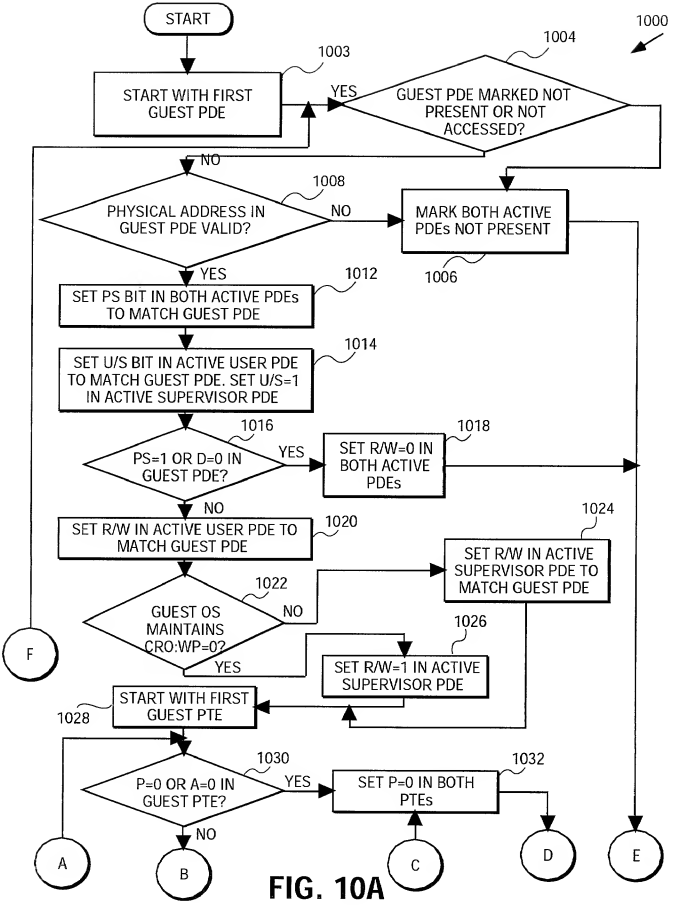


FIG. 10A

05725.1327.00

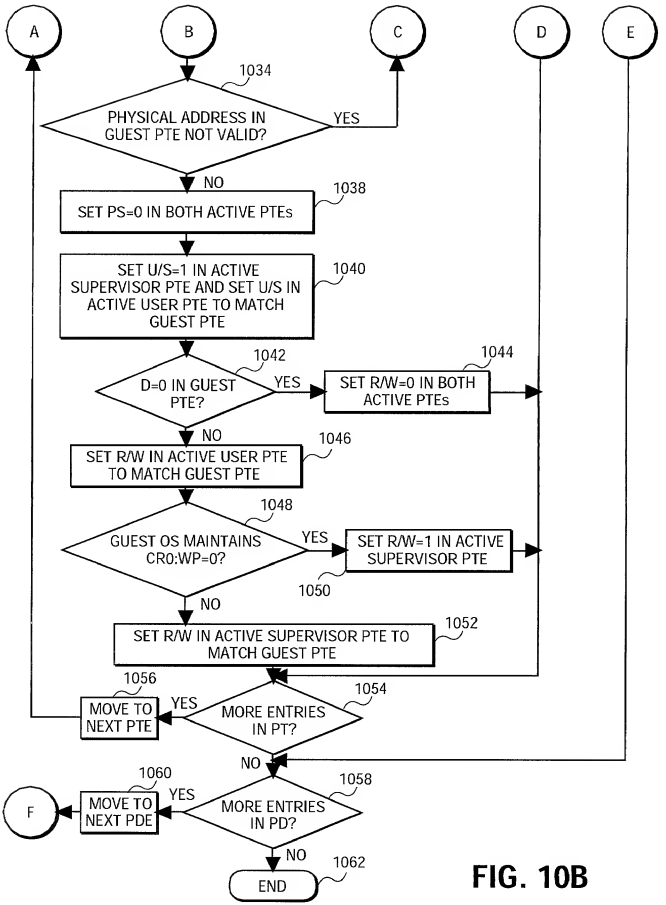


FIG. 10B

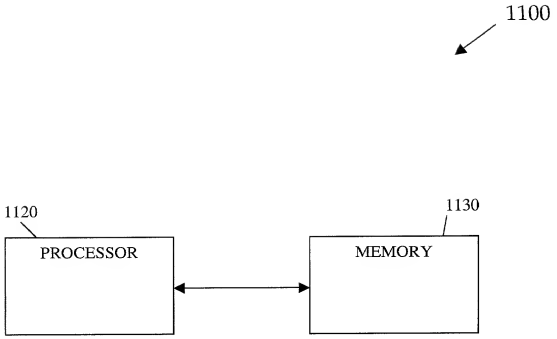


FIG. 11